FIELD SWATH AND DRIFT ANALYSIS TECHNIQUES

By

W. Clint Hoffmann, Andrew J. Hewitt, Jane A.S. Barber, Ivan W. Kirk, and James Brown

Background

- ASAE Standard S572 has already been discussed;
- Before the previous study and this report, there was no published data on the reference nozzles at aircraft speeds or field studies with the reference nozzles.

Objectives

- To concurrently measure spray deposition and droplet spectrum from ASAE Standard reference nozzles with commonly-used measurement systems;
- To evaluate the correlation between horizontal deposition collected with different sampling systems, specifically, water-sensitive paper, mylar cards, and magnesium oxide slides.

Study Parameters

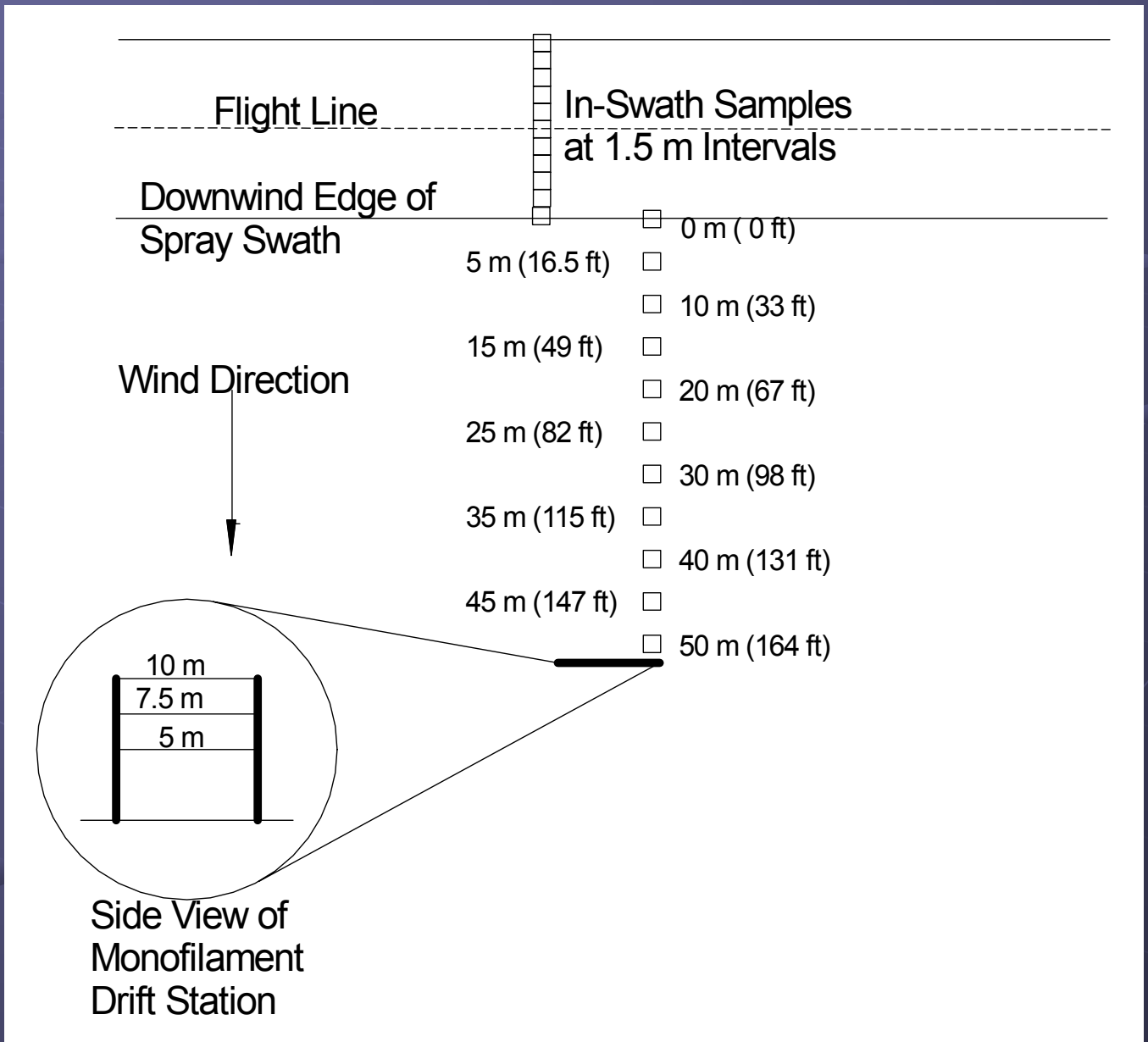
- Reference nozzles were placed on a Cessna 188 AgHusky:
  - 100 mph;
  - 6 feet height;
  - 45 foot swath width;
  - 3 gpa application rate.
- Weather conditions were consistent across all treatments.

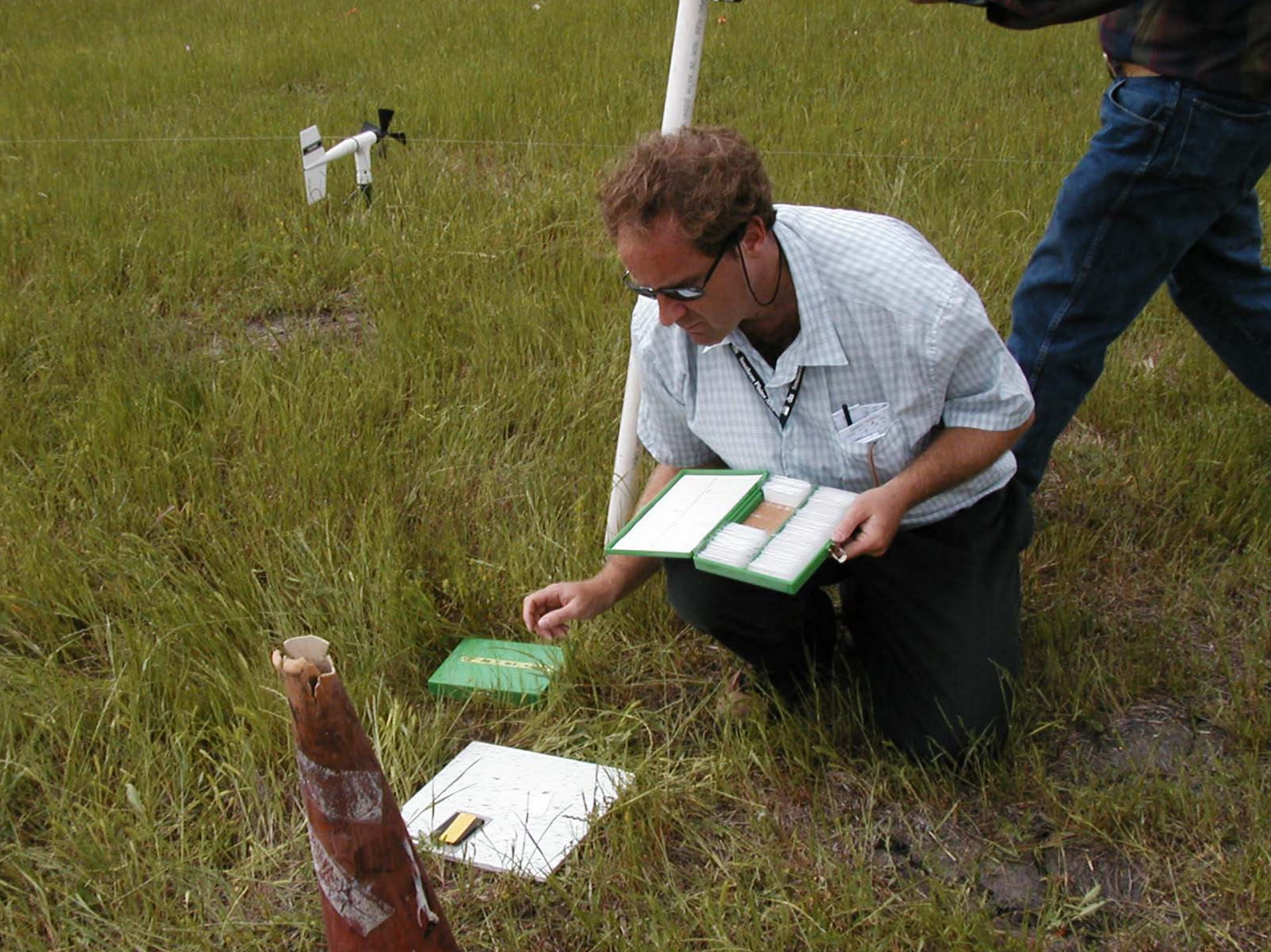
Nozzles and Operating Parameters

Class	Nozzle	$D_{V0.5}$[a] (µm)	Pressure (psi)	Nozzles on Boom	Treatment
VF/F	01F110	160	65	40	5
F/M	03F110	283	36	30	4
M/C	09F110	316	48	18	3
C/VC	8008	420	40	28	1
VC/XC	6510	462	35	24	2

[a] – Volume median diameter (µm) for a water only solution. Data measured using a Malvern 2600 in a 160 km/h (100 mph) airstream.

Study Layout

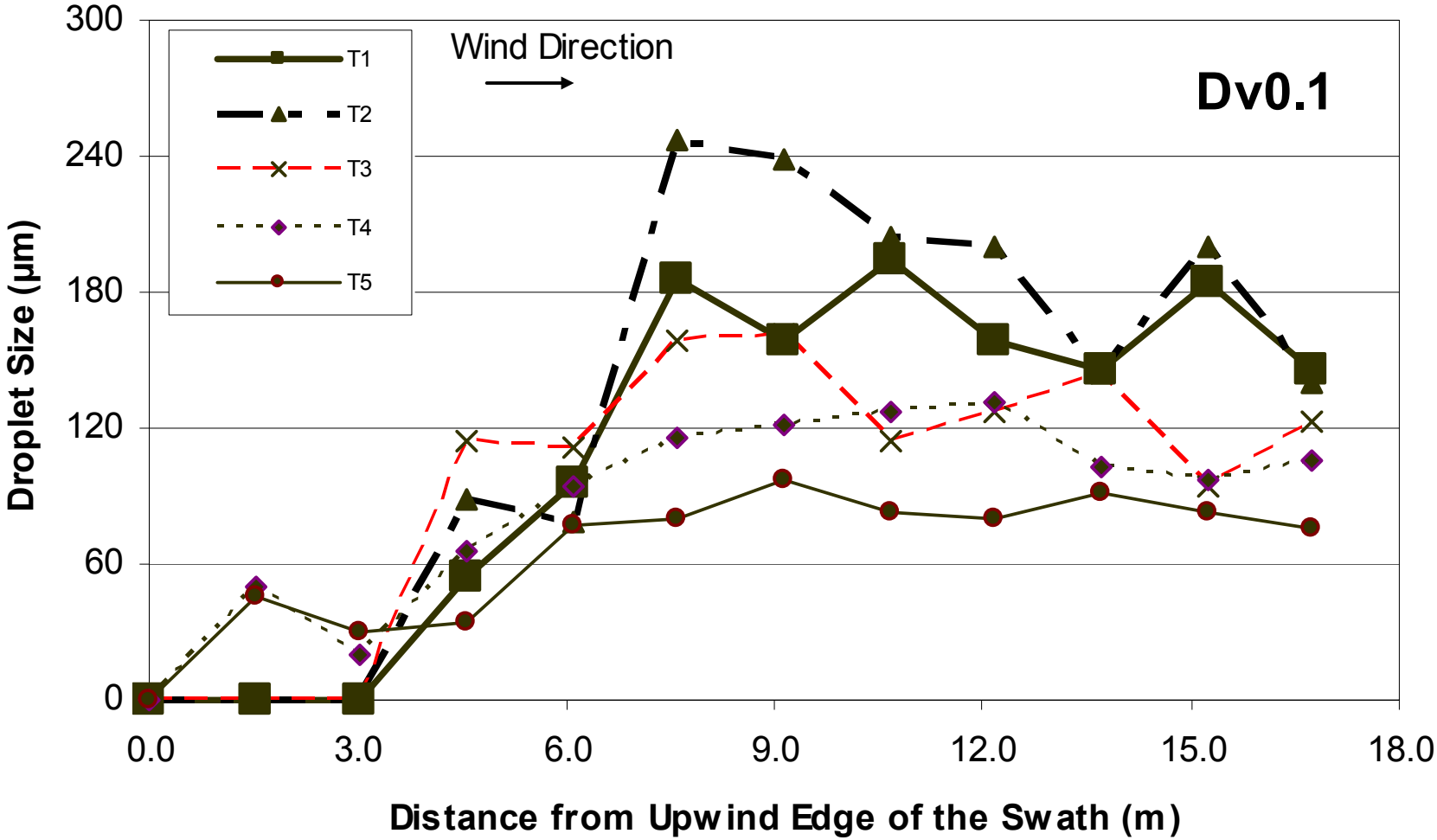




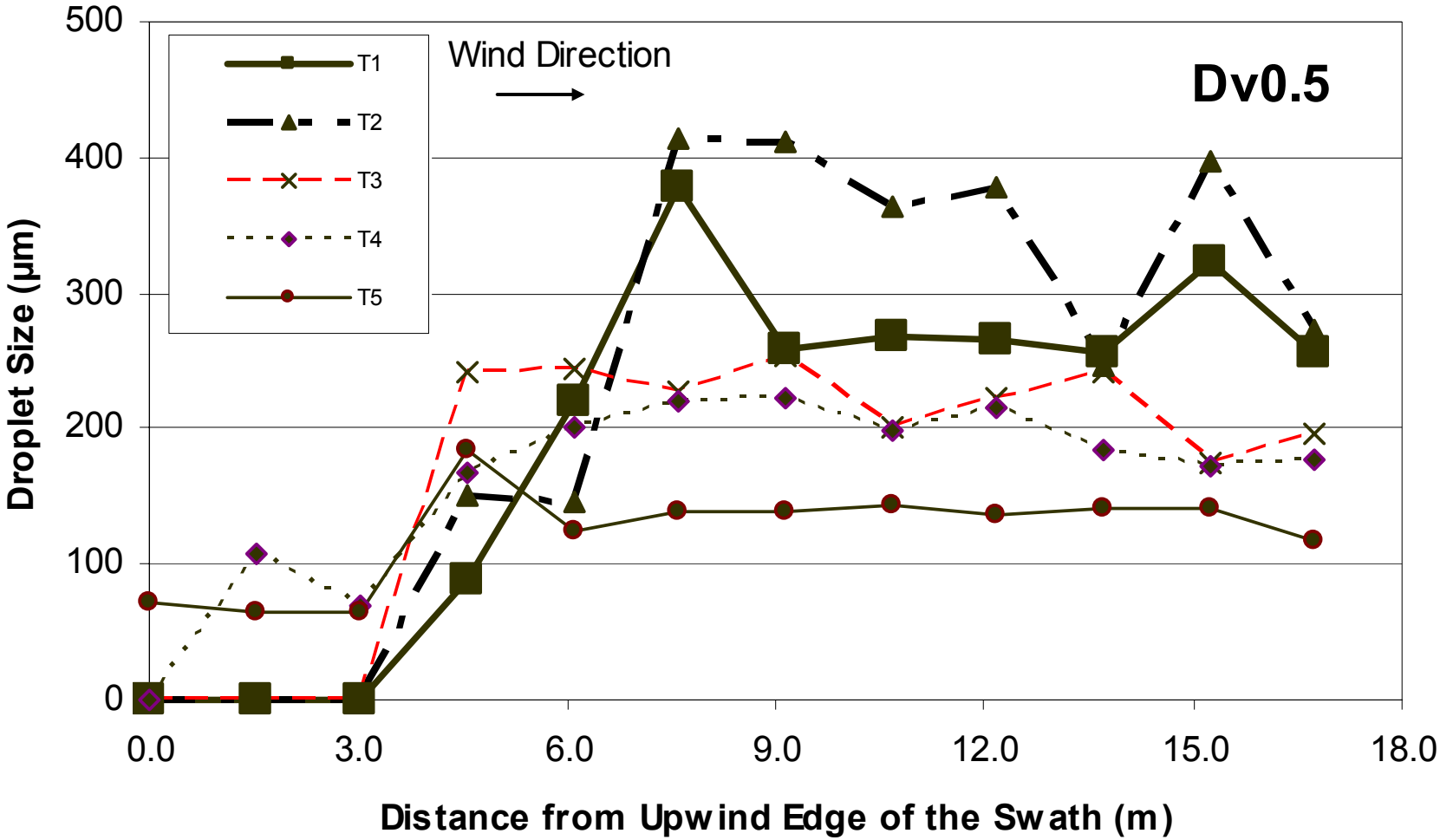
Samplers

- Water-sensitive paper (WSP);
- Mylar cards (15.5 in^2);
- Magnesium oxide (MGO) slides (1 in X 3 in);
- Monofilament lines at heights of 16, 25, and 33 ft suspended between towers that were 186 ft from spray line
- Sample analyses and handling is discussed in the paper.

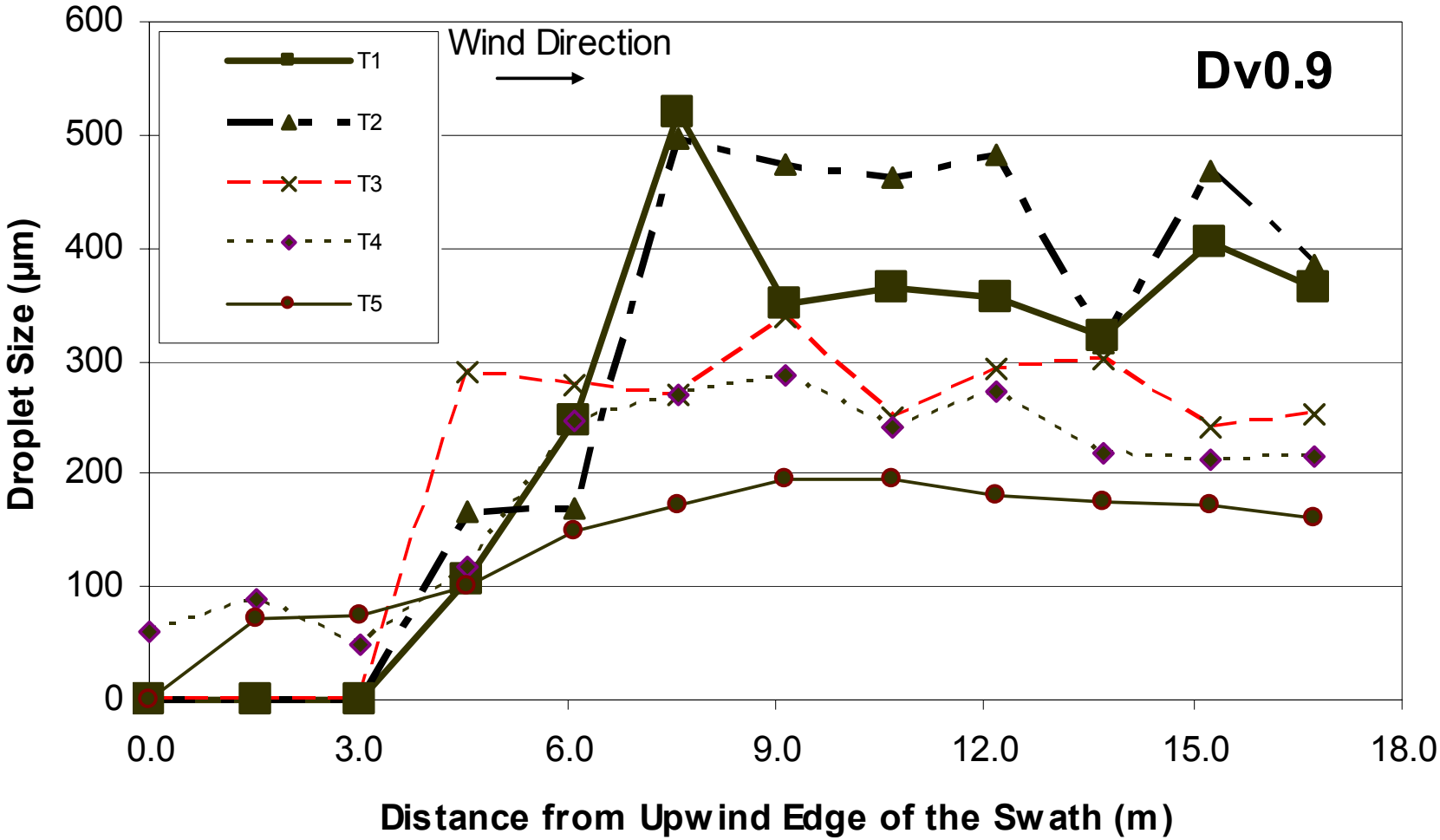
In-Swath Deposition – Dv0.1



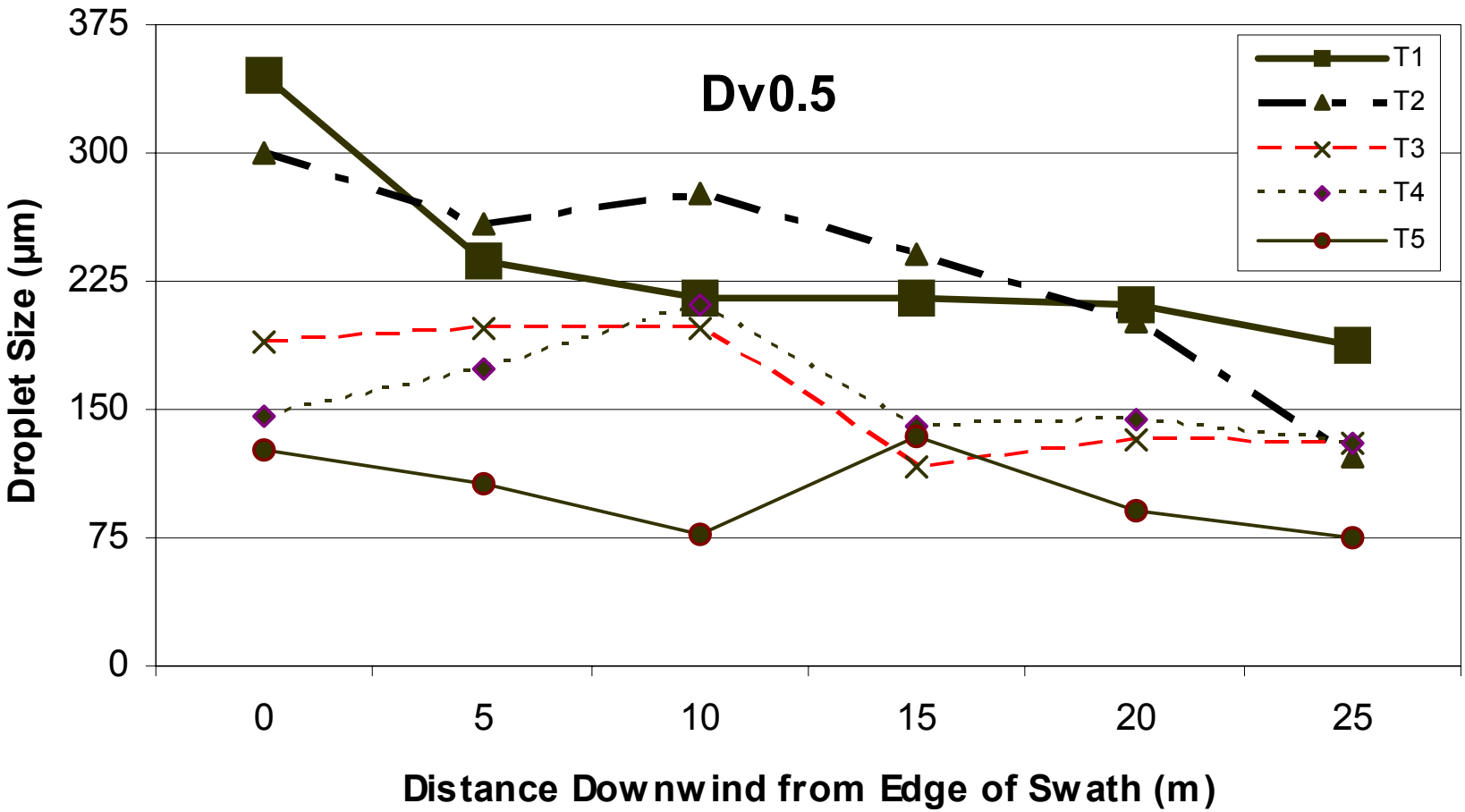
In-Swath Deposition – Dv0.5



In-Swath Deposition – Dv0.9



Downwind Deposition – Dv0.5



Correlation Analyses between Different Samplers

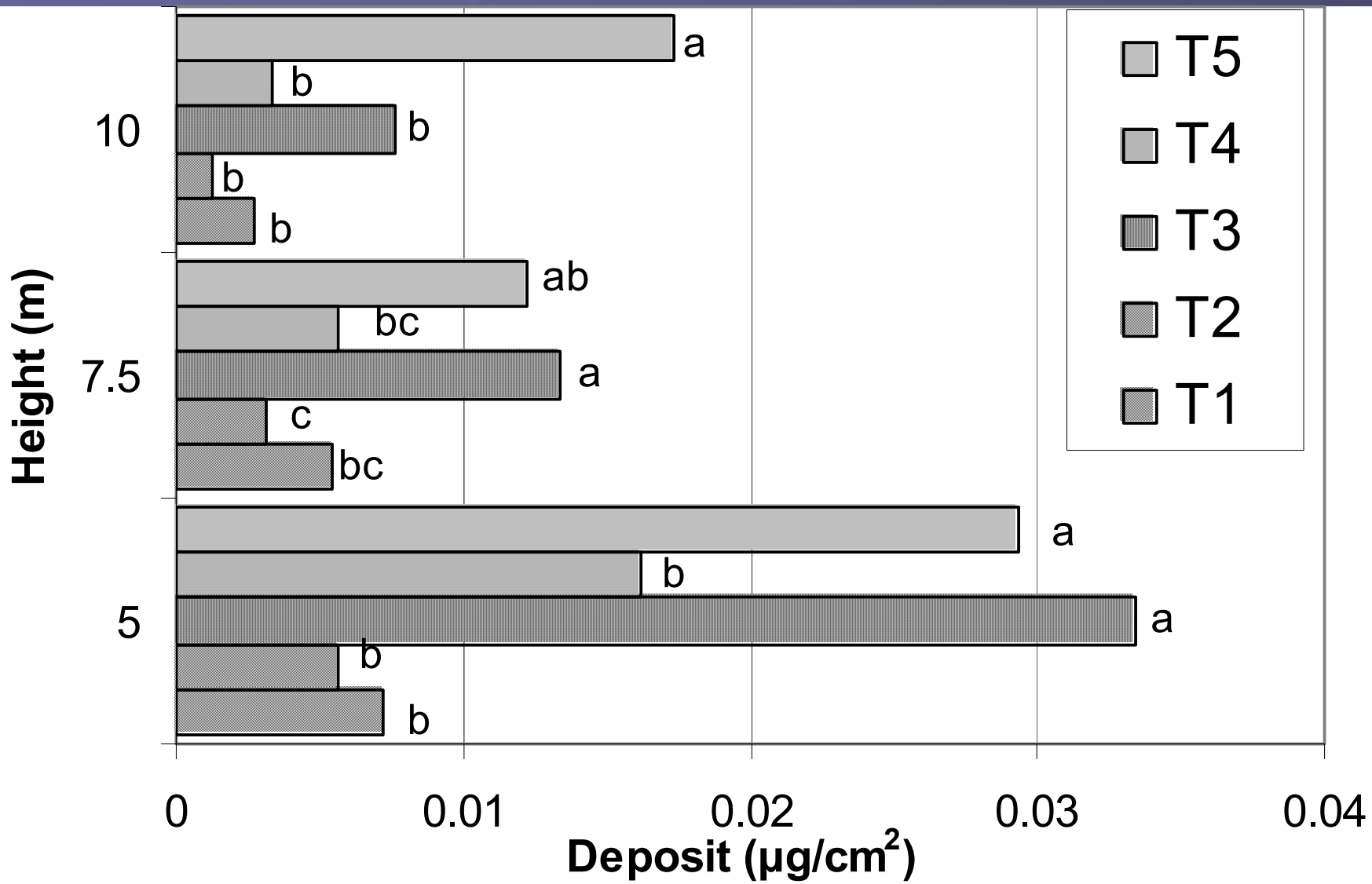
- Correlation: How well the different sampler matched in terms of trends not absolute deposition numbers (i.e. not quantification)

Correlation for samplers 0-86 ft from downwind edge of swath

	T 1	T 2	T 3	T4	T 5
Samplers	Correlation[a] (Prob > |r|)[b]	Correlation (Prob > |r|)	Correlation (Prob > |r|)	Correlation (Prob > |r|)	Correlation (Prob > |r|)
Mylar – MGO	0.5461 (0.0058)	0.6079 (0.0016)	-0.0584 (0.8570)	0.4594 (0.1330)	0.6365 (0.0261)
Mylar – WSP	0.9104 (0.0001)	0.9409 (0.0001)	0.6450 (0.0235)	0.2292 (0.4737)	0.2890 (0.3623)
MGO – WSP	0.4061 (0.0490)	0.6040 (0.0018)	0.3605 (0.2497)	0.5351 (0.0730)	0.6195 (0.0317)

Larger droplet treatments (1-2) had a significant correlation for all samplers but smaller droplets resulted in more variable data correlation.

Monofilament Lines



Summary

- The five reference nozzles from S572 were tested with droplet size data collected in field studies.
- Larger droplet treatments (1-2) had a significant correlation for all samplers but smaller droplets resulted in more variable data correlation.
- There was significant correlation between WSP and mylar cards in-swath.